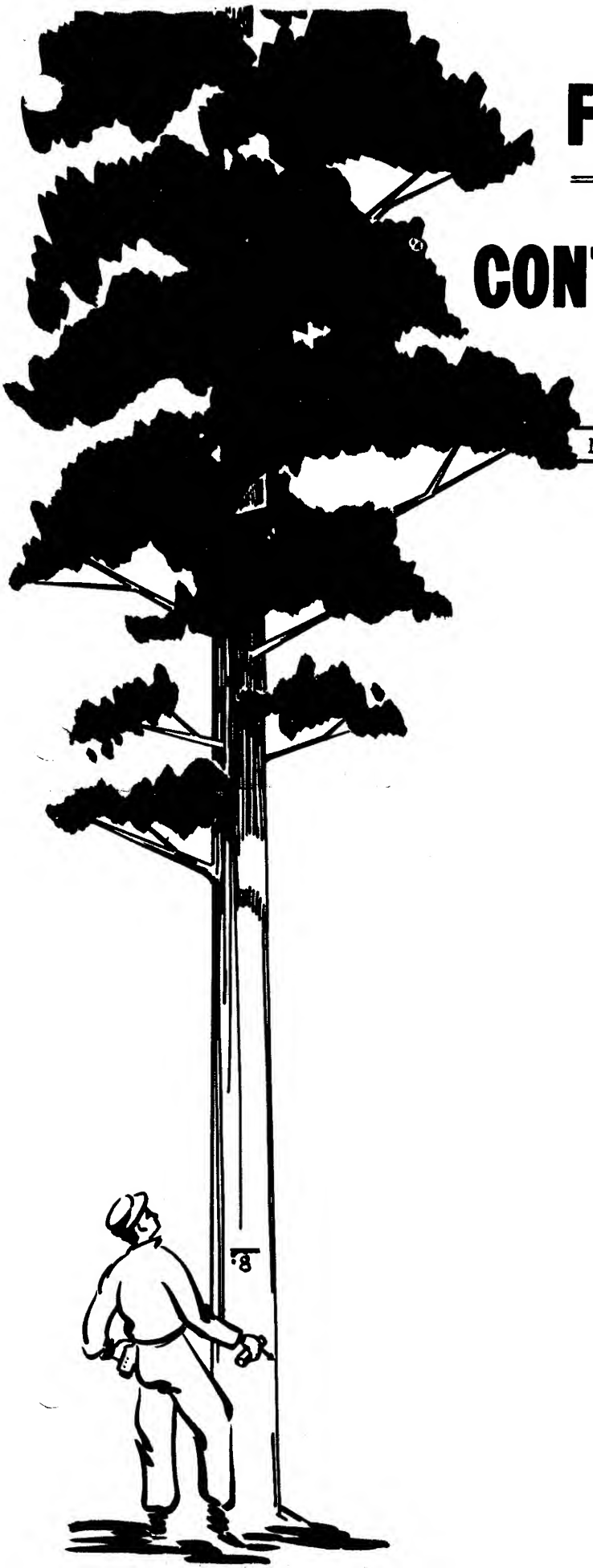

FOREST CONTROL by CONTINUOUS INVENTORY

"Today I have grown taller from walking with the trees."

...Karle Wilson

Milwaukee, Wis. May, 1964 No. 122

In all things, success depends on previous preparation, and without such preparation there is sure to be failure.

Confucius

STATE AND PRIVATE FORESTRY IN REGION 7 PREPARES A COMPENDIUM ON VOLUME TABLES FOR CFI

In the short timber country east of the Mississippi, the determination of individual tree dimensions and volumes need not be excessively refined. As pointed out by Bill Barton in the paper which comprises this Newsletter, Composite Volume Tables for cordwood and sawlogs are perfectly satisfactory. The tables prepared by S. R. Gevorkiantz and presented in Lake States Forest Experiment Station Bulletin No. 1104 are applicable over most of this wide forest area. Measurement of diameters at breast height and usable lengths has developed into a satisfactory technical process. CFI Newsletter formulae are adequate computing tools with either the calculating punch or the electronic data processors. Table look-up and interpolation methods as proposed by Barton are equally satisfactory and desirable.

Background reasons for recommended volume table procedures are generally known in the eastern regions, but perhaps these reasons should be repeated.

The bulk of the timber is pulpwood or small sawlogs between 5" and 16" in diameter with 20- to 40-foot usable lengths. More than half of the usable lengths can be accurately taken with pole and U-gauge. The trees are ideally suited to computation with Composite Volume Table formulae or look-up tables. Species, bark thickness, and form class variations are not extreme and are satisfactorily adjusted by standard species correction factors. Furthermore, the true net volume of individual trees in 20% to 40% of the cases depends more often upon cull deduction decisions than upon the accurate measurement of inherent tree form variations.

Cal Stott
Forester
U. S. Forest Service, Region 9

VOLUME TABLE LOGIC

By
W. W. Barton, Forester
U. S. F. S. Region 7

Volume formulae and species factors of the Lake States can be used in the Northeast, as well as in the North Central Region. On many occasions it has been shown that trees of individual species - whether growing in the Lake States, the Central States, or the Northeast - have very similar volume characteristics.

There seem to be three volume table concepts and three ways of putting the volumes into the records. These are:

1. The locally made table
2. The general form-class table
3. The composite table

The first of these - the local - requires a lot of work, but fits the timber on the location for which it is made. Years ago, all we had (if we didn't want to make a volume table ourselves) was a collection of locally made tables - like Bulletin No. 39 of the Lake States and similar collections put together by forest schools and experiment stations throughout the country. Unable to take the time to make our own, we made the best of it and used the table from the collection that seemed to fit best, based only on a casual check. These collections were a great help.

The second - the form-class table - reached its peak with the printing of the "in-service" Girard-Mesavage form-class booklet of tables in the late 1940's. Form-class tables have merit; but are more often misused than used correctly. Often the misuse results from lack of knowledge of the table construction. It is misused especially by foresters who would like to appear super-professional but who are reluctant to study the table construction.

Having the form class of an individual tree, the proper table may be sought out and a very close volume read. Allan Bickford decided the taper above the first log for white pine in York County, Maine, differed so much from the upstem taper used by Girard and Mesavage, that he took some measurements and built special form-class tables for this particular area. Possibly the Girard-Mesavage tables could have been used with a species factor instead of making a set of special tables.

The principal problems with form class are that it takes a full-time expert cruiser to estimate form class, and that form class varies all over the lot on a single sample plot. Most of the "form-class cruising" is done by neglecting to tally any form class and then selecting a table for FC 78 or 79 to use as a general table.

This is a good lead into the third kind of volume table - the composite. This is based on large volumes of empirical field data gathered over a very wide range of area. Being made from empirical data, it has the normal trend of form class within a stand built in. Trees short for their diameter, have lower form classes than do the tall slim variety. Trees of each species have certain characteristics of bark thickness and usual taper that make a single adjustment factor for the species fit over the entire table. This single factor may be changed or checked by measuring sections cut from a few trees (or from inside bark measurements made at 8-foot intervals on standing trees).

The composites proved to be exceptionally reliable, convenient and readily adjustable to fit individual species and local conditions. The adjustment is by local authority.

The story of the composite is long, but we shall try to give a brief accounting here. Separately, and unknown to one another, during the late 1930's the Lake States Forest Survey and the Eastern Region National Forests gathered a tremendous amount of data on tree volumes over widely separated areas. Both found that a single table fit a species over the whole wide range and that the tables for the different species were factorially related. Many research foresters were involved in making and checking both composites.

The Eastern Region composite used beech as a basis -- 100%. The Lake States composite used sugar maple as a base. For beech volumes, the LS table is increased about 15%. Conversely, for maple, the Eastern Region table is decreased 11%. Most foresters are familiar with USDA Technical Bulletin No. 1104 which fully documents the Lake States table. For lack of such documentation, the Eastern Region table has nearly been forgotten; although it is used on some national forests by foresters who know nothing of its origin or qualities.

These two composite tables fit each other well. The Lake States composite tables are reliable for use throughout the East. With species factors which you can check yourself, the tables will give good volumes for individual trees. Our set of suggested species factors are those contained in CFI Newsletter No. 65. We suggest these be used until a local check has been made.

Just how we go from a good volume table to the individual tree volume, punched in a card, is another matter. There are three ways which vary in their exactitude.

When precise data are kept for each tree, there is not much sense in being slipshod with the tree volume. We have come all the way from formulae for local volume table curves to very complicated formulae for individual trees. Examples of all these kinds can be found in CFI operations today.

The simple formula - Volume = A + B (diameter)^2 (height) - is too simple to fit all over a volume table. The formula of Tom Jones, shown in CFI Newsletter No. 98, fits pretty well all over the table; but it is too complicated for use on small computers. Before either of these types appeared, our usual system was the Residual Volume Method using A and B factors as described in CFI Newsletter No. 55.

We have been somewhat dissatisfied with all of these methods. They have been compromises as we waited for data processing machines to develop. The best method, because it is the only one both practical and accurate, is "table look-up and interpolation". It can be done on an IBM 650 or IBM 1620. It can be rough for an IBM 1401 with only 4000 digits storage. We have taken a new look at table look-up and interpolation. Our explorations have led to a system that can use any volume table and will work efficiently on either the IBM 604 Calculating Punch with only 32 digits storage, or any more sophisticated computer. This method, our master cards for the Lake States Composite Volume Tables, and the associated species factors, are all being prepared now and will be available to anyone within a month. We highly recommend the Lake States Composite Volume Tables as described in USDA Technical Bulletin No. 1104, for use in the Northeast.

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